

WinSRFR/SRFR: Software for the Hydraulic Analysis of Surface Irrigation Systems

Prepared for AgTech Showcase
2013

Eduardo Bautista
Research Hydraulic Engineer

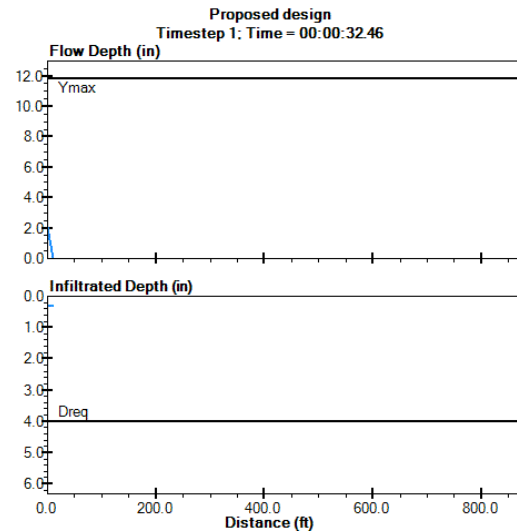




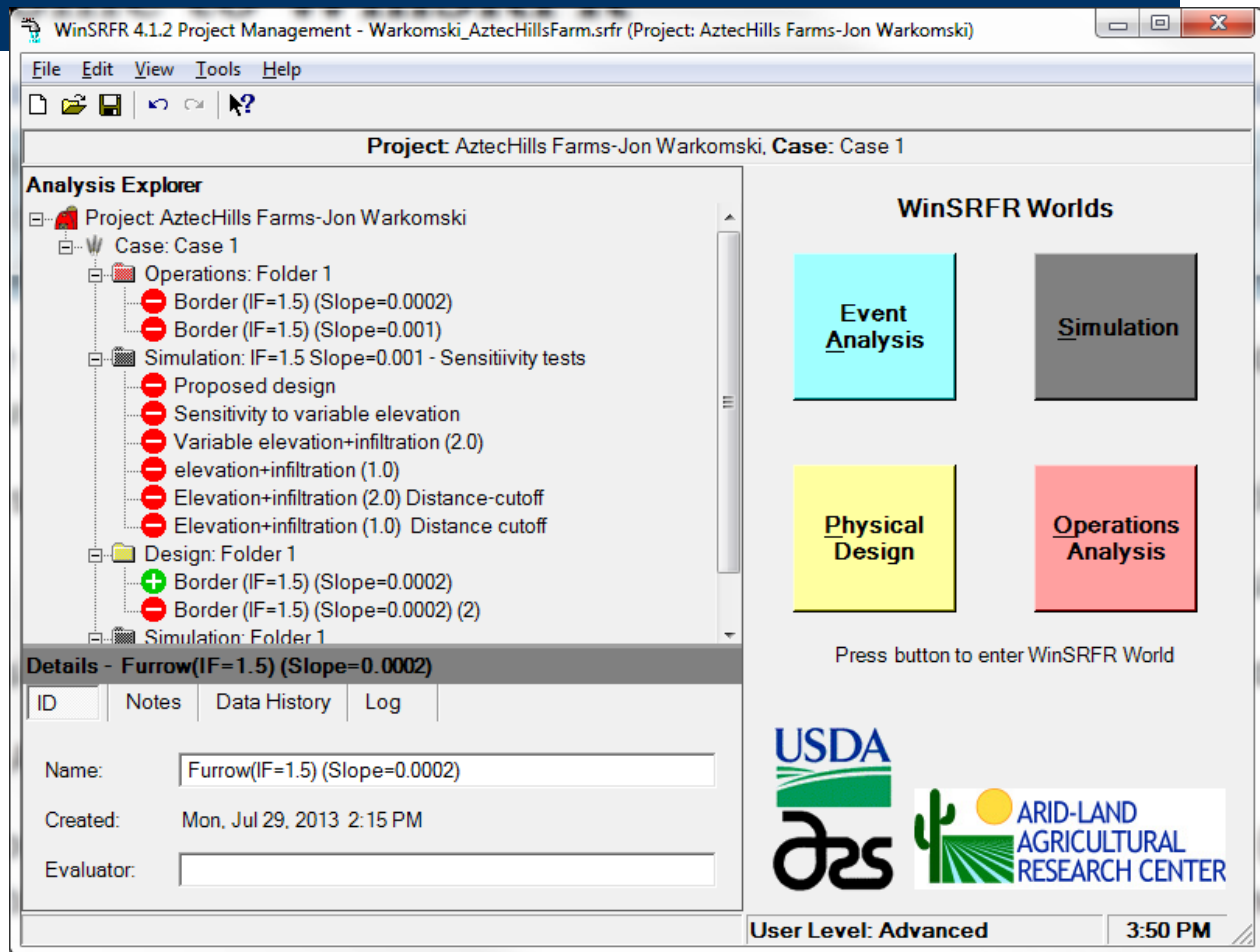
OVERVIEW

Surface irrigation hydraulics

- Modern analysis of surface irrigation systems is founded on unsteady open-channel flow concepts



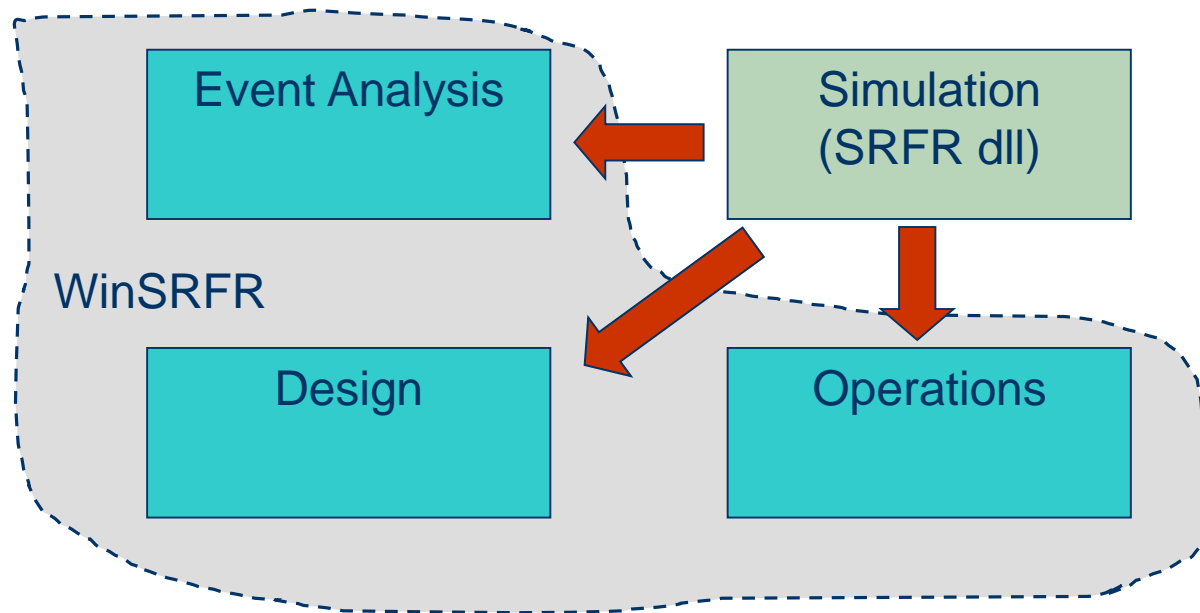
WinSRFR – Functionalities



WinSRFR integration of models

- WinSRFR uses different models for different purposes and selects model appropriate for different situations or type of analysis
- Software hides mathematical complexities from users
- Mathematical formulations are numerically accurate and robust

SRFR is the simulation engine and the “backbone” to other functionalities



Release History

- Legacy DOS Programs: SRFR, BORDER, BASIN
- V1 - 2006
- V2 - 2007
- V3 - 2009
- V4 - 2012
- V5 - targeted for 2014
 - New functionalities : constituent transport

Who uses WinSRFR?

- NRCS
- Education/extension
- Researchers
- Consultants
- Landowners

How is this technology currently distributed?

- Windows application
- Public domain software, distributed through the ARS website
- SRFR.dll distributed as part of the WinSRFR package
- We do not distribute the source code

What is the future potential use of this technology?

- “Despite technological innovations, at least half of U.S. irrigated cropland acreage is still irrigated with less efficient, traditional irrigation application systems.”

United States
Department of
Agriculture



Economic
Research
Service

Economic
Information
Bulletin
Number 99

September 2012

Water Conservation in Irrigated Agriculture: Trends and Challenges in the Face of Emerging Demands

Glenn D. Schaible and Marcel P. Aillery



THE SRFR DLL

SRFR dII

- Recently reprogrammed using a modern object-oriented, extensible architecture
- Developed in Visual Studio
- New SRFR functionalities can be derived from existing classes
- SRFR exposes its object through a programmable API
- Built-in debugging interface

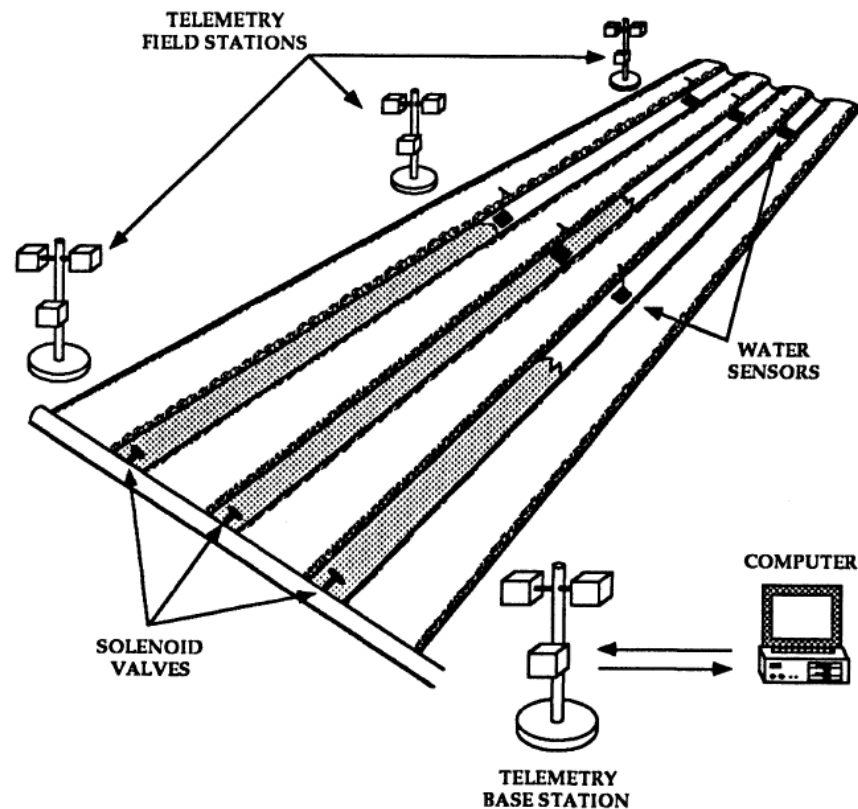
A decorative graphic in the top-left corner consisting of a light green square and a white rounded rectangle. A thick dark blue horizontal bar with rounded ends spans across the top of the slide.

OPPORTUNITIES FOR COLLABORATION

Potential topics

- Automated surface irrigation systems
- Farm level irrigation management

Automated control concept



(Latimer and Reddell 1990)

Previous research

Control Requirements and Field Experience with Mechanized Level Basins

A. R. Dedrick
MEMBER
ASAE

FEEDBACK-CONTROLLED SURGE IRRIGATION: II. OPERATING CRITERIA

D. Fekersillassie, D. E. Eisenhauer

MAXIMIZING SET-WIDE FURROW IRRIGATION APPLICATION EFFICIENCY UNDER FULL IRRIGATION STRATEGY

B. Izadi, D. Studer, I. McCann
MEMBER
ASAE

MACHINE VISION MONITORING FOR CONTROL OF WATER ADVANCE IN FURROW IRRIGATION

Y. Lam, D. C. Slaughter, W. W. Wallender, S. K. Upadhyaya

SEMI-AUTOMATION OF IRRIGATED BASINS AND BORDERS: III. CONTROL ELEMENTS AND SYSTEM OPERATION

A. S. Humpherys

WATER SENSOR FEEDBACK CONTROL SYSTEM FOR SURFACE IRRIGATION

A. S. Humpherys, H. D. Fisher

Operative irrigation modelling for real-time applications on closed-end furrows

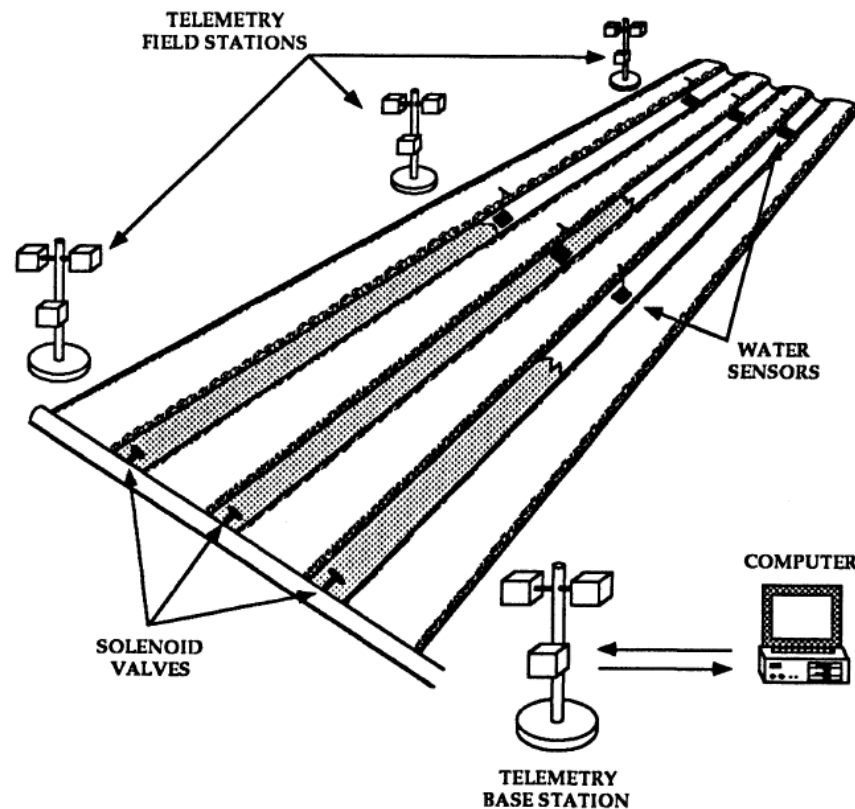
J.C. MAILHOL¹, M. BAQRI² & M. LACHHAB²

¹Cemagref, Bp 5095, 34033 Montpellier, Cedex 1, France; ²ORMVAG, Kenitra, Morocco

AUTOMATION OF SURFACE IRRIGATION BY CUT-OFF TIME OR CUT-OFF DISTANCE CONTROL

M. Niblack, C. A. Sanchez

Supervisory control concept



Supervisory
Control
package

(Latimer and Reddell 1990)

Farm level irrigation management

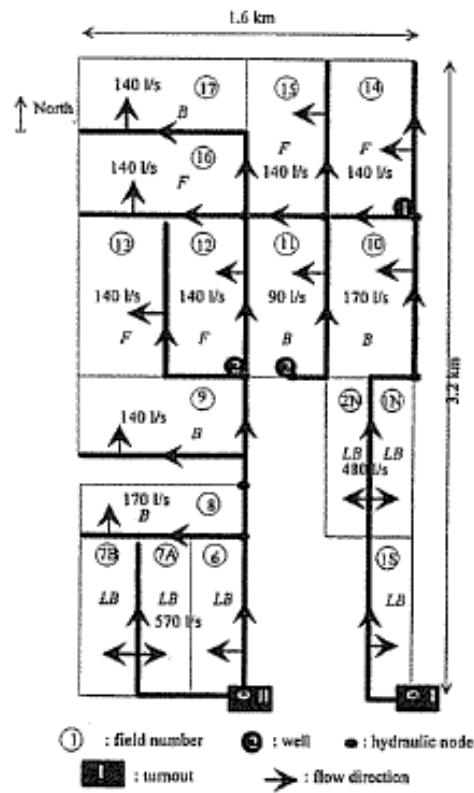


Figure 1. Farm description.

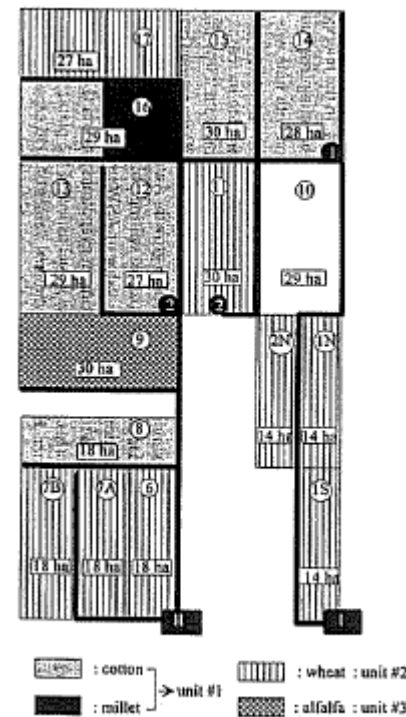


Figure 2. Cropping pattern in 1994.

Example research



Contents lists available at ScienceDirect

Computers and Electronics in Agriculture

journal homepage: www.elsevier.com/locate/compag

Original paper

An integrated model for simulation of border-check irrigated dairy pasture production systems

P. Douglas^{a,*}, K.B. Dassanayake^b, D.F. Chapman^b, I.R. Johnson^c, M. Khanna^d, H. Malano^d

^a Bureau of Meteorology, Victoria Regional Office, PO Box 1636, Melbourne, Victoria 3001, Australia

^b Melbourne School of Land and Environment, The University of Melbourne, Parkville, Victoria 3010, Australia

^c IMJ Consultants, PO Box 1590, Armidale, NSW 2350, Australia

^d Department of Civil and Environmental Engineering, The University of Melbourne, Parkville, Victoria 3010, Australia